FINE SPRAY PROTECTION OF SHIPBOARD ENGINE ROOMS

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Twenty-three fire tests were conducted to determine the ability of current fine water spray (mist) technologies to extinguish fires in the International Maritime Organization (IMO) fire test procedure[1] for engine rooms greater than 500 m^3 in volume. The fire tests were conducted using nozzles installed at a 5 m height and 1.5 m spacing in the FMRC Test Center (2800 m^2 in area and 18 m in height). Two types of nozzles were used: a low pressure commercial nozzle operating between 1.2 MPa and 1.5 MPa with a flow per nozzle between 12.0 and 13.4 lpm and a high pressure multi-nozzle prototype consisting of seven nozzles operating at 6.9 MPa, flowing 5.3 lpm. These nozzles were selected because they had previously been shown to be capable of extinguishing the IMO engine room test fires in an enclosure with a protected area of 83 m^2 and a ceiling height of 4.5 m (see Reference 2). The fire tests selected from the IMO fire test procedure included 6 MW diesel spray fires on top of the IMO engine mock-up, a 6 MW shielded spray fire adjacent to the engine mock-up, a 1 MW shielded diesel spray fire at the same location, and a wood crib within a 2 m^2 pan filled with heptane. The IMO engine mock-up is shown in Figure 1.

Sixteen fire tests were conducted in which no additional enclosure surrounded the fine water spray nozzles other than the large test facility as required in the IMO test method for Class III engines (volumes greater than 3000 m^3). Using either the low pressure nozzles or high pressure prototypes, the IMO test fires were not significantly affected by the fine water spray when 36 nozzles (protected coverage area of 81 m^2) were installed. Increasing the number of nozzle to 100 for the low pressure nozzles or 90 for the high pressure nozzles did not improve the performance of the fine spray systems.

To further investigate fine spray system capabilities, a ceiling was then placed directly over the nozzles covering an area of 188 m^2. Using 90 high pressure prototypes, the IMO test fires were not extinguished. A 940 m^3 enclosure was then formed by dropping tarpaulins to the floor from the ceiling. A 4 m^2 vent was placed in the wall. The 6 MW diesel spray fire on top of the mock-up was then extinguished with the 90 high pressure prototypes (see Figures 2 and 3). When the 6 MW fire was shielded beside the mock-up, the fire was not extinguished. Closing the vent resulted in extinguishment of the 6 MW shielded spray fire. Under the same test conditions, a 1 MW shielded diesel spray fire and a 0.1 m^2 heptane pool fire were not extinguished. The fire test results suggest that protection of engine rooms with volumes of about 1000 m^3 is possible by optimizing current fine spray technology; while larger volumes will require significantly improved discharge characteristics. Complete details of the study are given in Reference 3.

ACKNOWLEDGEMENTS

This work was supported by the U.S. Coast Guard Research and Development Center under delivery order DTCG39-95-F-E00280. We wish to thank Professor Robert G. Zalosh for his support through the WPI Center for Firesafety Studies. The plans for the IMO engine mock-up were developed by Mr. William Brown of FMRC. Mr. Donald Charlebois and Mr. Dennis Waters were in charge of fire testing at the FMRC Test Center.

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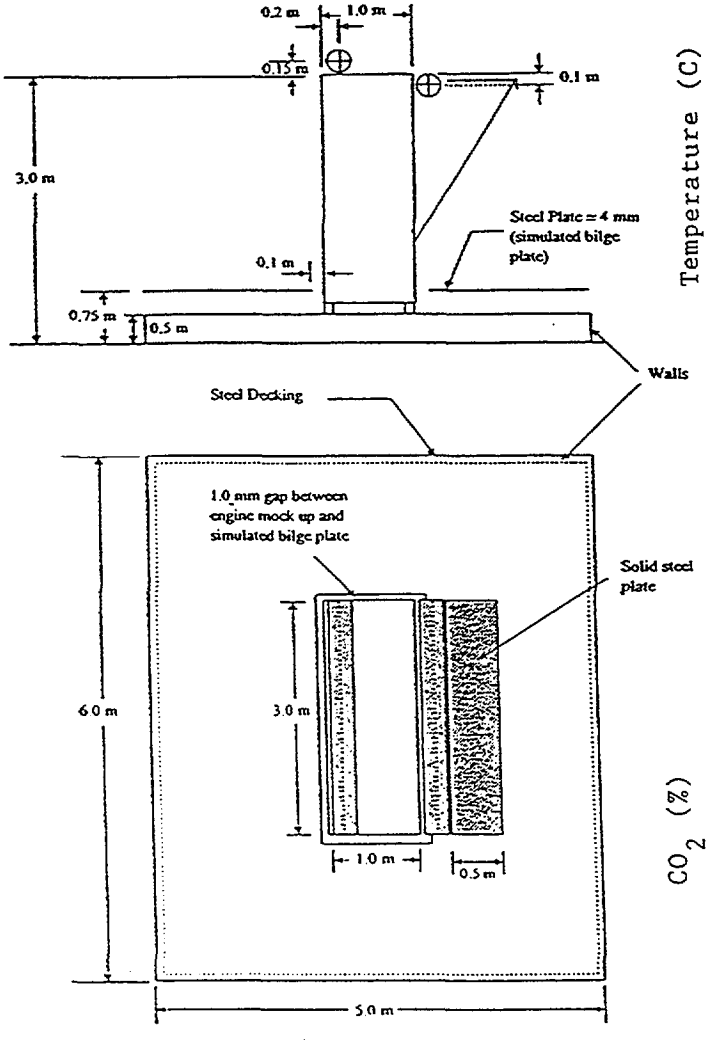

Figure 1. IMO Engine Mock-Up (West Side and Plan View)

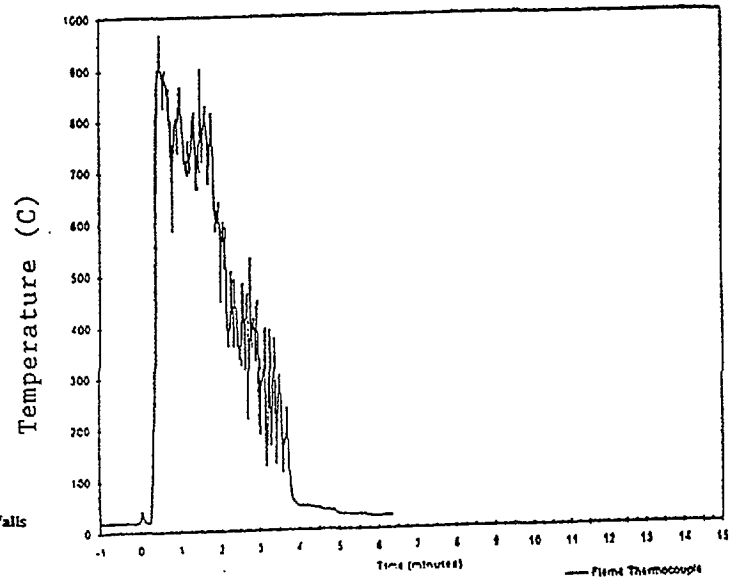

Figure 2 Flame temperature in a 6 MW diesel spray fire (Test 19) with Spraying Systems seven-nozzle head

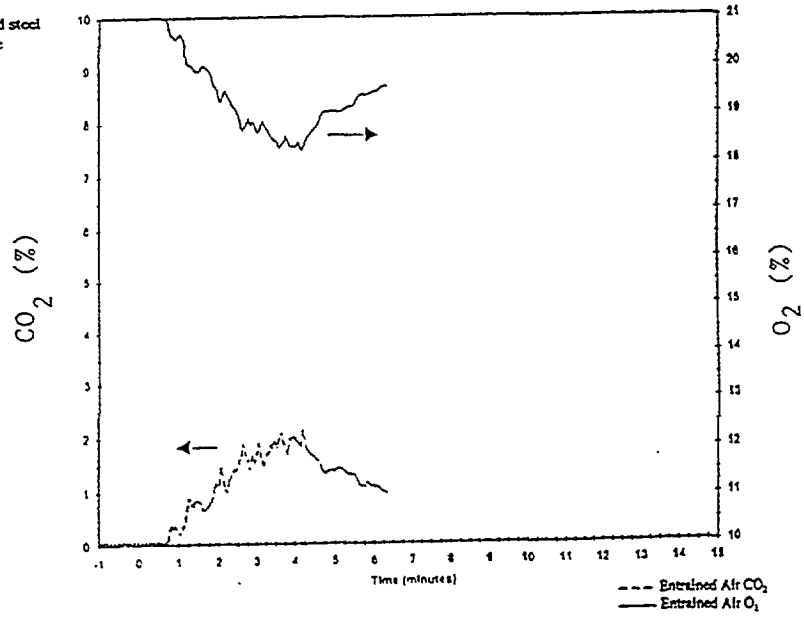

Figure 3 Oxygen and carbon dioxide concentrations adjacent to a 6 MW diesel spray fire (Test 19) with Spraying Systems seven-nozzle head